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feet, entirely free. Upon digging into one of the rooms, Mr. Siler found parched corn and rope in a good state of preservation.

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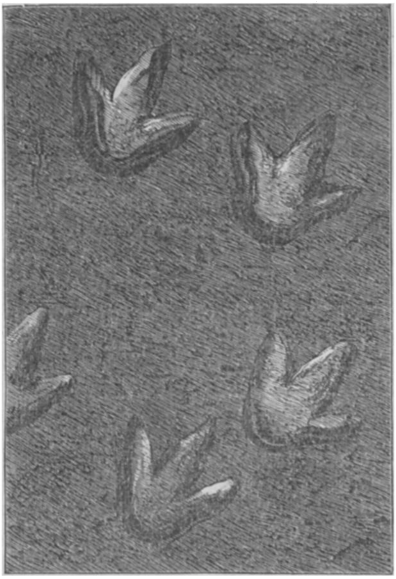
GEOLOGY AND PALÆONTOLOGY.

ON THE OCCURRENCE OF FOOTPRINTS OF DINORNIS AT POVERTY BAY, NEW ZEALAND.—When in Auckland, New Zealand, in 1875, my attention was drawn to some specimens of "Moa" footprints then in the museum of the Auckland Institute. After examining them carefully, I determined to procure some of these rare specimens for myself; with this intention I made a visit to the locality, which is on the right bank of the Taruheru river, near Gisborne, Poverty bay. Here I found what I so much desired to see in place, where hundreds and perhaps thousands of years ago, these great birds, sauntering in search of food, left their footprints indelibly impressed on the sand.

The portion of rocks in which the tracks are made (though many of them were nearly effaced by the action of the waves) was about fifteen to twenty feet in length, and from six to eight feet in width. Many of the impressions were close together, and with few exceptions were of nearly the same size. The tracks pointed in various directions, but some of them followed each other at regular intervals like successive tracks of the same bird, the strides were about nineteen to twenty inches from heel to heel. I noticed, however, some smaller tracks with strides of twelve and a-half to thirteen and a-half inches, which seem to accompany the larger tracks, as if they were made by a young bird, but these were too much effaced to be procured. At still another place I noticed some small tracks, such as might be made by a bird no bigger than a pigeon.

The tracks are in a soft sandstone which is being rapidly worn away by the action of the water and the weather, and the impressions are gradually disappearing. The sandstone is a mud deposit. We may imagine then, that these birds walked over the still wet sand, left by the receding of the river, a short time after it had subsided, leaving their tracks, and that afterwards the wind arose and drifted a coarser sand over them, as well as over the whole surface of the mud, to a depth of about half an inch.

The spot where the tracks are exposed to view is about at high water mark, and therefore much washed by the waves and so much effaced as to be scarcely worth removing. But by following up the surface of the sandstone stratum in which they occur, and judging by the direction they led, I split off numerous slabs of the overlying strata, in hopes of finding some better specimens, finally I traced them under a shallow bank, which was, perhaps, eight feet high, and was the lower part of a large plain; the upper portion is perhaps twenty-five to thirty feet high in some places, but whether these impressions ran under this to any great distance, it would be most impossible to tell unless a shaft was sunk on this plain. Running through the plain there are two rivers, viz: the Kopututea, which is formed by the confluence of the Waipaoa and the Arai, and occupies a middle position, rather towards the south-west of the plain; and the Taruheru, which falls into the sea at Poverty bay, at the north-eastern corner of the bay. At this point it was composed of sandy alluvium, containing shelly layers of recent species; below this occur successive strata of imperfectly solidified sandstone from four to six inches thick, and separated from each other by a thin layer of coarser sand and small pebbles, from a quarter to half an inch thick, and it is owing to this layer of comparatively loose sand that the impressions are so well preserved. At this point I dug out a slab two feet by three feet, of this soft sandstone, which is probably of Post-drift age. This rare specimen contains four fine footprints and part of the fifth; length of stride of these footprints is nineteen inches; track from heel to toe, eight inches; from first claw to third claw, eight and a-half inches. The extreme depth of the heel of most of these were from one inch to one and a quarter below the ordinary surface of the rock. The stride is so short for such a large bird, that they must have been walking at a very leisurely pace, in fact all the other prints would indicate the same thing. These were found in about the fifth or sixth layer below the alluvial deposit referred to, and have a dip perhaps of about six degrees to southwards. But so far as could be ascertained, no "Moa" bones have ever been found, in this vicinity, imbedded in the recent rocks such as that in which the footprints occur.


Footprints of Dinornis (Moa).

The accompanying cuts will give a better idea of these, taken from specimens which I dug up myself, also showing *fac simile* casts made from the same specimens, showing the footprints in relief.

The original is now in the museum of the University of California, Berkeley.—*C. D. Voy.*

GEOLOGICAL EXAMINATIONS IN TEXAS.—After the middle of December of the past year, I examined the Little Wichita, along its whole course from its mouth to its remotest sources, together with all its right and left hand branches. After that I went to the Big Wichita, and traveled over all that region for about one hundred miles, from the mouth of the river and along its branches on both sides.

The time which I consumed in these regions amounted to over six months. The result of my investigations surpassed in scientific aspects all my expectations. I found not only many new plants and animals, consisting of petrified ferns, fishes and reptiles, but discovered a new extinct vegetable and animal world, hitherto wholly unknown in America. According to these petrifications, the whole region spoken of belongs to the transition period, and especially to the permian formation; both the lower and the upper are therein apparent.

In a mineralogical view I found there the following:

A. Rocks—sandstone as well as limestone is abundantly diffused and eminently suited for building purposes, both on account of their hardness and stratification.

B. Metals—1. Iron ores; *a*, spar iron ore, or spherosiderite, pure and clayey; *b*, brown iron ore; *c*, yellow iron ore, as bean ore and limonite; *d*, hematite and ironglance, or silicate of iron.

2. Copper ores; *a*, malachite; copperglance; *c*, azurite.

3. Zinc ores; *a*, zincspath; *b*, zincblende.

4. Lead ore; as leadglance.

Among iron ores, the pure and clayey spherosiderite appears most frequently. The red and variegated clay strata, often 50 and 60 feet thick, are almost always overlaid with sandstone or limestone; all iron ores are contained in these clay deposits, and laid in compact masses, 2 inches to 2 feet thick, in more or less regular strata or in pockets.

Brown iron ore is seldom deposited as such in clay, but appears mostly from spherosiderite, exposed to the air and weather-beaten. On the other hand, yellow iron ore is found bound together in round pieces, from the size of a pea to that of a pigeon egg, abundant in some places, and is then called bean ore; or it forms hard, brown-red, heavy masses, containing very many animal remains, in which it is named limonite.

Through the influence of succeeding geological periods, the sandstone and limestone covering the clay strata were in some places destroyed; the soft clay laid bare was in the course of time by rain washed away, and thus there were produced the valleys, bluffs, hollows and ravines. The heavy masses of iron ores remained behind, and have by degrees so accumulated that there are stretches a mile wide on which hundreds of tons of iron ore can be gathered on the surface of one acre, without the aid of shovel or pick. When the spherosiderites are disintegrated and washed out they often acquire the appearance of slag, and have therefore formerly been taken for volcanic scoria.

The iron ore of the permian period of north-western Texas is diffused over a surface which extends over more than one hundred miles in length and over fifty miles in width. The outwashed and cleansed mass on the surface is so large that it would suffice to supply the whole United States with iron for ten years.

Copper ore is there often encountered, especially as malachite and copper glance; the latter is often mixed with coal, particularly when the petrified mass is formed from wood, However, I have now here seen these ores in inexhaustible quantities. I found them most abundant on the lands of the Texas Copper Mining and Manufacturing company. Zinc, in the form of zincspar and zincblende, exists in some places; there is also iron ore, especially spherosiderite, containing zinc. Lead is found sparingly injected in spherosiderite and very hard clay masses. I have nowhere yet found coal deposits in the permian formation, but the permian is bordered on the whole south side by the genuine coal formation, which covers the latter in almost its entire extent. Coal layers two to eight feet thick come to the surface some miles off from the boundary, and it may with certainty be assumed that stone coal can be reached at a moderate depth near the deposits of iron ore of the permian period. If we cast a glance over the mineral kingdom of northwest Texas, and compare the same with that of England, we discover there the same appearances. In this respect Texas is equally favored, while its coal deposits in the earth, together with those of iron ore, embrace a space double that of England.—*Jacob Boll.*

GEOGRAPHY AND TRAVELS.[1]

THE ASCENT OF THE BINUÉ, IN AUGUST, 1879.—Of the few large rivers to be found on the African continent, the Niger and its tributary, the Binué, probably present fewer obstacles to navigation and afford the most uninterrupted means of access to the still unexplored equatorial region. The recent voyage, therefore, of the missionary steamer *Henry Venn*, which succeeded in reaching a point on the latter stream 140 miles further than has ever before been attained by boats is of much importance. We compile the following account of the trip from papers read before the Royal Geographical Society, by Mr. Edward Hutchinson,[2] and before the Berlin Society, by Herr Ed. Robert Flugel,[3] and also from statements furnished by the latter to *Petermann's Mittheilungen.*[4]

Mr. Hutchinson in his preliminary remarks upon the area drained by the rivers Binué and the Shary, discusses the much vexed problem of the identity of the Welle discovered by Schweinfurth, and which he and Keith Johnston believe to flow into the Shary, but which Stanley and Junker consider as belonging to the Congo system.

> "The northern and eastern limits of the area drained by these two river systems are now fairly well ascertained. The travels of Petherick, Schewinfurth, Nachtigal, and Dr. Junker, have shown them to be, on the north-east, the ranges which run from the Tibesti mountains, and on the east the ranges which run through Darfur to Mount Baginze and west of the Albert Nyanza, the eastern slopes of which form the gathering grounds of the Bahr el Homr, the Bahr el Gazal, and the White Nile.
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> "The southern limits of the area we are considering, are as yet unknown. They will probably be found to be ranges of hills of no great elevation, running westwards

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[1] Edited by ELLIS H. YARNALL, Philadelphia.

[2] *Proceedings of the Royal Geographical Society*, May, 1880, p. 289.

[3] *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, Band VII, No. 3, p. 112.

[4] *Petermann's Mittheilungen*, April, 1880, p. 146 with preface, by Dr. E. Behm, p. 145. See also number for June, 1880, for account of the voyage of the *Henry Venn* from the mouth of the Binué to Djen, also by Herr Flugel.